

Measurement of Maximum Permissible Exposure

1. Foreword

In adopt with the Human Exposure IEEE C95.1, and according to the FCC 1.1310. The *Maximum Permissible Exposure (MPE)* is obligated to measure in order to prove the safety of radiation harmfulness to the human body.

The *Gain* of the antenna used is measured in an *Anechoic chamber*. The *maximum total power to the antenna* is to be recorded. By adopting the ***Friis Transmission Formula*** and the *power gain of the antenna*, we can find the distance right away from the product, where the limit of the MPE is.

2. Description of EUT

FCC ID	:	MSQDPC2434
Product Name	:	Wireless Cable Modem
Model Name	:	DPC2434
Frequency Range	:	2.412GHz ~ 2.462GHz
Channel Spacing	:	5MHz
Support Channel	:	11 Channels
Modulation Skill	:	DBPSK, DQPSK, CCK, OFDM

3. Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	100	6
3.0-30	1842/f	4.89/f	900/f ²	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	100	30
1.34-30	824/f	2.19/f	180/f ²	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

[The EUT is tested in transmit and receive modes and in the first, middle and the last channel separately.

The following shows only our observation have the greatest emissions.]

According to OET BULLETIN 56 Fourth Edition/August 1999, Equation for Predicting RF Fields:

$$\text{Friis Transmission Formula: } S = \frac{PG}{4\pi R^2} = \frac{201.84 \times 1.58}{4\pi(20)^2} = 0.063 \text{ mW/cm}^2$$

$$\text{Estimated safe separation: } R = \sqrt{\frac{PG}{4\pi}} = \sqrt{\frac{201.84 \times 1.58}{4\pi}} = 5.038 \text{ cm}$$

Note: "The safe estimated separation that the user must maintain from the antenna is at least 6.5cm"

Where: S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

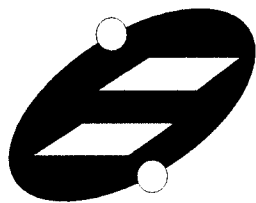
The Numeric gain G of antenna with a gain specified in dB is determined by:

$$G = \text{Log}^{-1} (\text{dB antenna gain} / 10)$$

$$G = \text{Log}^{-1} (2.00 / 10) = 1.58$$

Appendix

Antenna Specification



WHA YU INDUSTRIAL CO., LTD. (HEAD OFFICE)
TAI HWA ELECTRONIC CO., LTD.(CHINA)
SHANGHAI HUA YU ELECTRONIC CO., LTD.(CHINA)
AEON TECH CO., LTD. (CHINA)

SPECIFICATION FOR APPROVAL

CUSTOMER: 華碩電腦股份有限公司

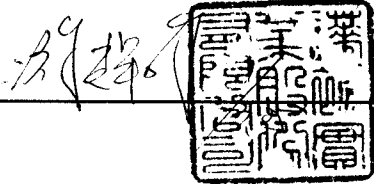
PART NAME: RF Antenna Assembly

PART NO.: 14G150001000

REVISION:

W. Y. P/NO.: C660-510003-A

REV.: X2

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :		

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Contents

<i>Item</i>	<i>Description</i>	<i>Page</i>
1.	天線規格表	 1
2.	成品圖	 2
3.	測試報告	 3~5
4.	Cable 規格	 6~7
5.	Connector 材質特性	 8
6.	SGS 測試	 9~38

RF Antenna Cable Assembly

Specification

1. Electrical Properties :

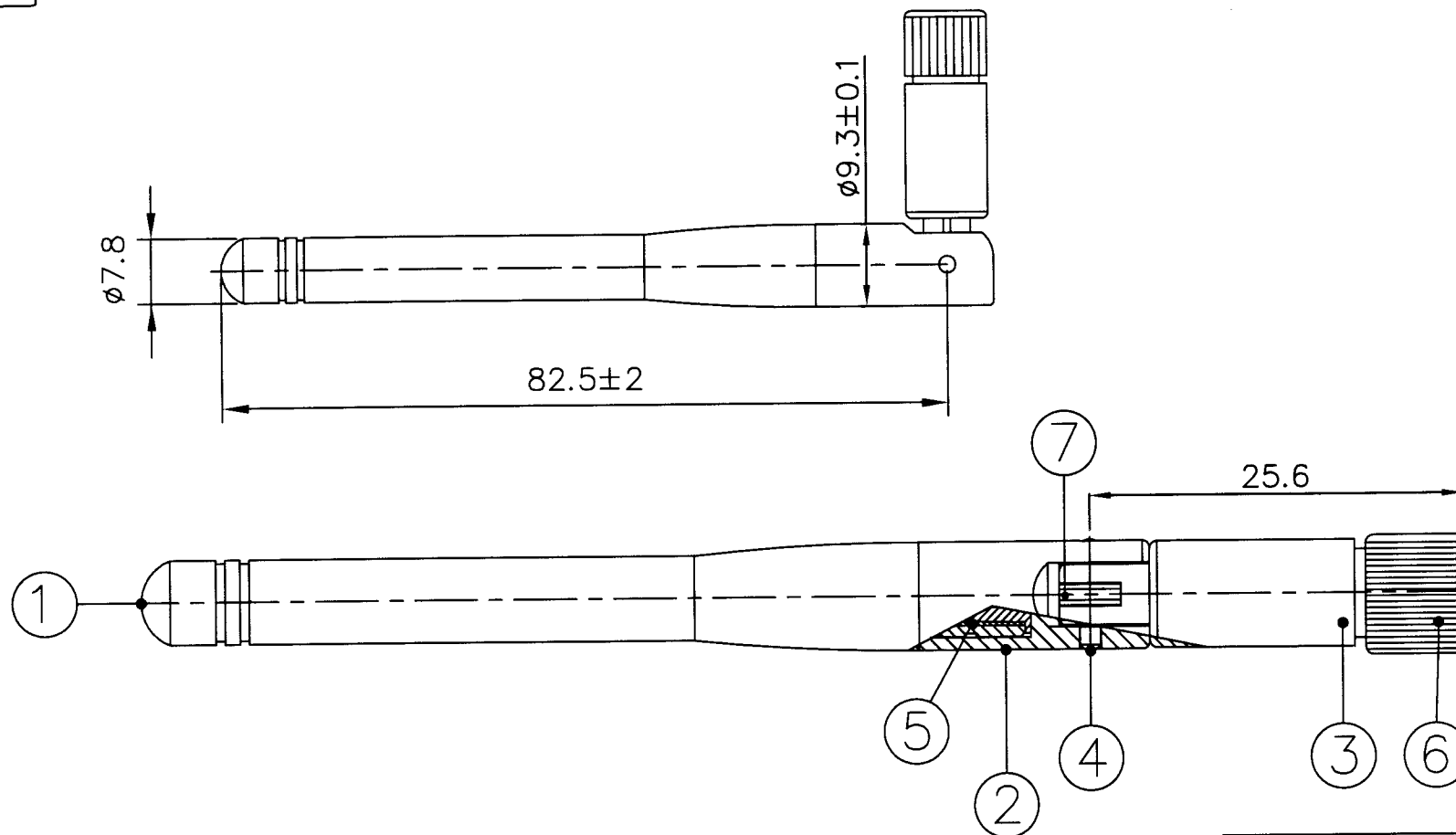
- 1.1 Frequency Rang..... 2.4GHz ~ 2.5GHz
- 1.2 Impedance 50Ω Nominal
- 1.3 VSWR 1.92 Max.
- 1.4 Return Loss..... -10dB Maximum
- 1.5 Electrical Wave..... $1/2 \lambda$ Diople
- 1.6 Gain..... 1.8 dBi
- 1.7 Admitted Power..... 1W

2. Physical Properties :

- 2.1 Cable..... RG-178 Cable
- 2.2 Antenna Cover..... TPE
- 2.3 Antenna Base..... PC
- 2.4 Operating Temp. -20°C ~ +65°C
- 2.5 Storage Temp. -30°C ~ +75°C
- 2.6 Color Black
- 2.7 Connector..... SMA Plug Reverse

CG-

REV	DATE	DESCRIPTION
X1	02/19-2004	New Issue



NO	DESCRIPTION	QTY	REMARK
7	Cable	RG-178, Translucent Brown; 50 Ω	1
6	Connector	SMA Straight Plug/Reverse	1
5	Ground Tube	Brass, Ni plated	1
4	Rivet	Brass, Black Surfaced	2
3	Antenna Base	PC; Color:Black	1
2	Antenna Base	PC; Color:Black	1
1	Antenna Cover	TPE; Color:Black	1

CUSTOMER'S SIGNATURE

XX	±3.0	APPROVED
X	±2.0	Winston 7/22
X	±1.0	CHECKED
XX	±0.5	
XXX	±0.1	DRAWING
		Jane 2

CUSTOMER: 華碩科技股份有限公司

PART NO :

PARTNAME: RF Antenna Cable Assembly

W.Y P/NO : C660-510003-A

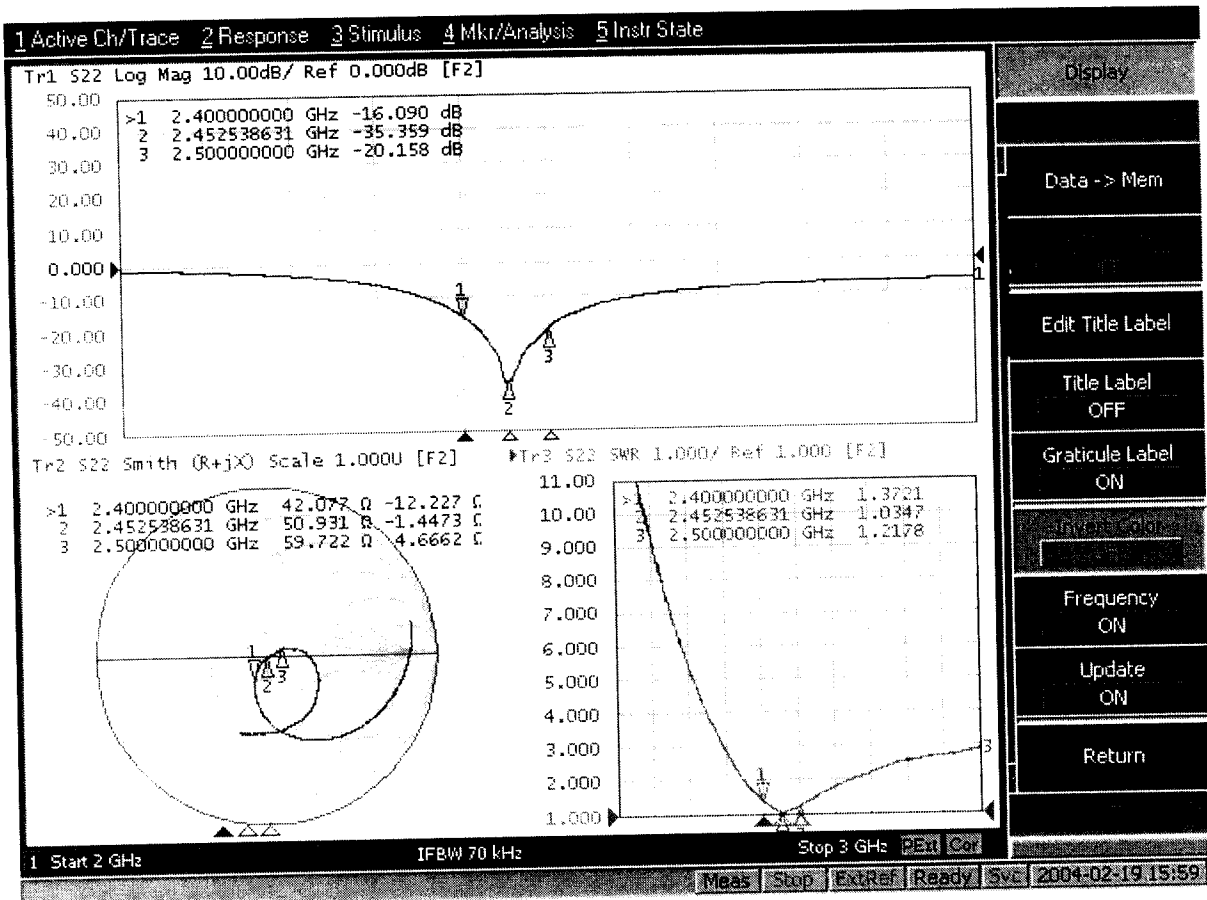
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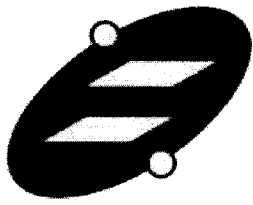
X1 mm SHEET: 1/1

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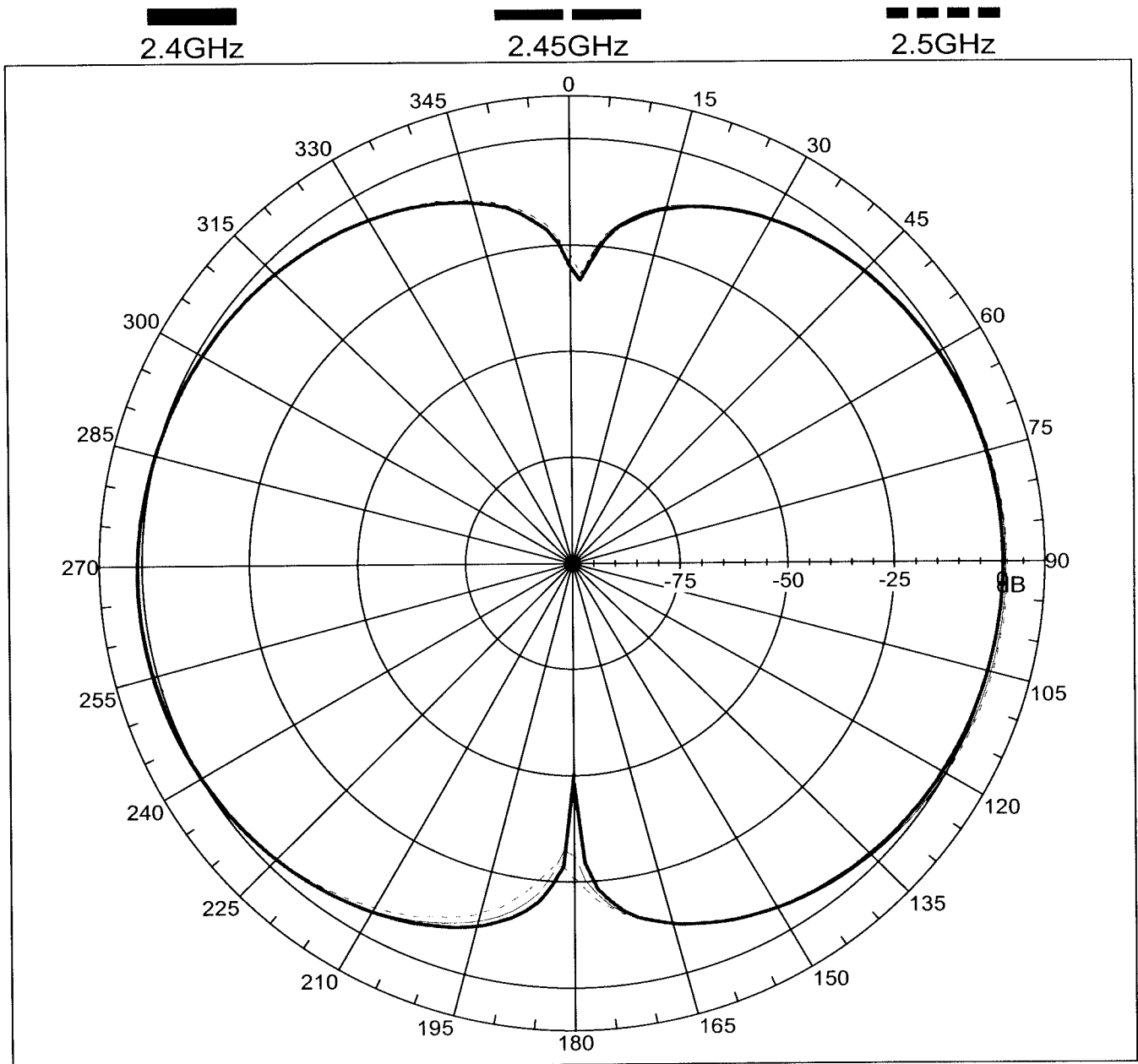


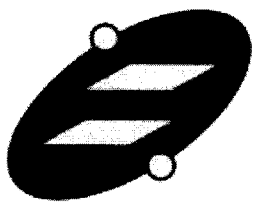


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Far-field amplitude of 2.4GHz small dipole antenna-E-plane.nsi

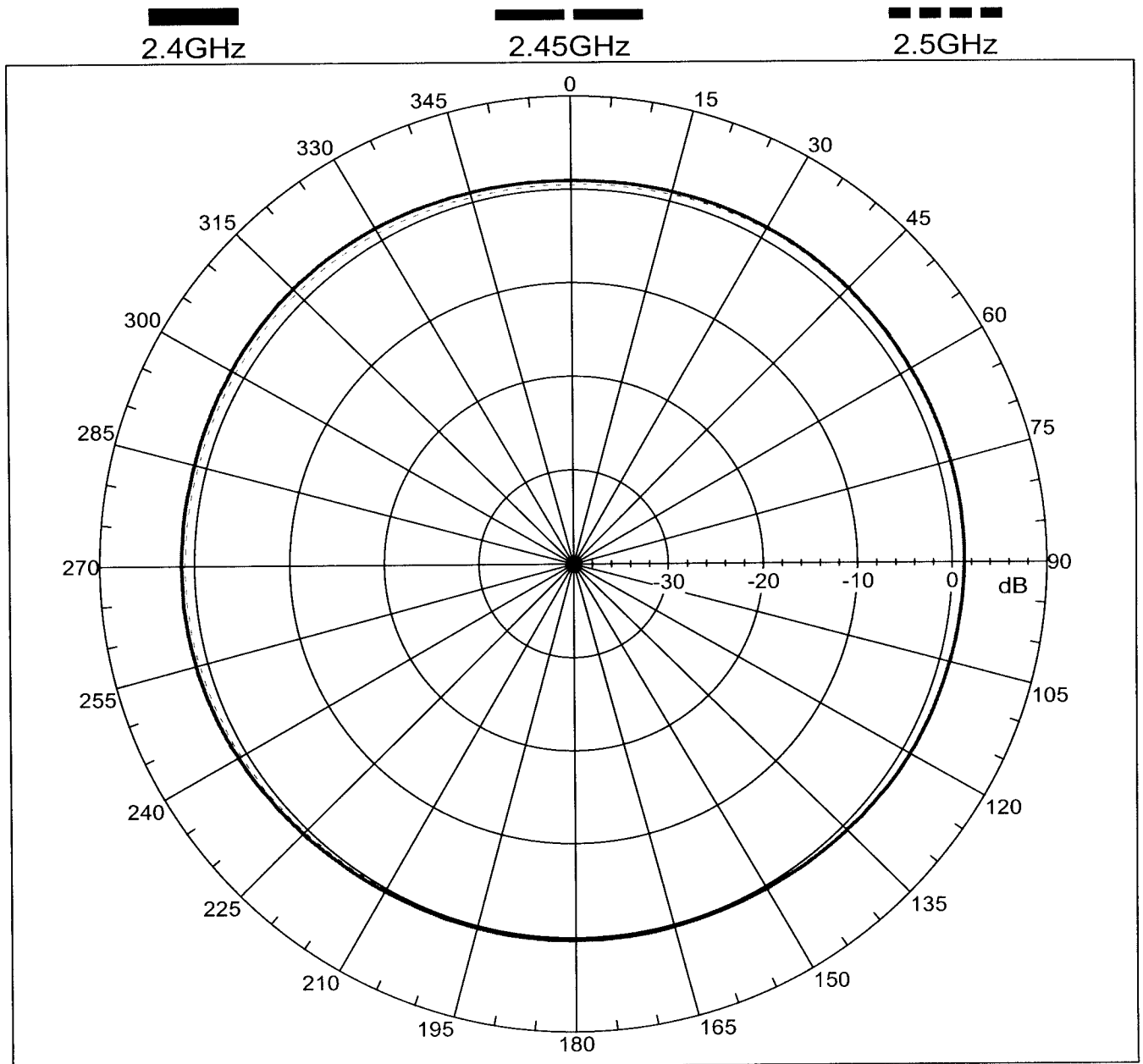




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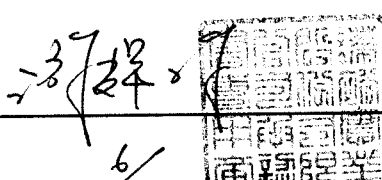
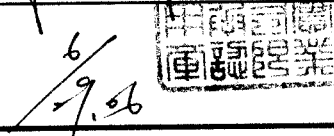
PART NAME: RF Antenna Cable Assembly

ASUS PART NO.: 14G152056000

REVISION:

W. Y. P/NO.: C660-510019-A

REV.: X2

	MANUFACTURER SIGNATURE	CUSTOMER SIGNATURE
APPROVED BY :		
DATE :		

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Contents

<i>Item</i>	<i>Description</i>	<i>Page</i>
1.	Cable Assembly規格表	1
2.	成品圖	2
3.	測試報告	3
4.	Cable 規格	4~6
5.	Connector材質特性	7~8
6.	SGS測試	9~53

RF Cable Assembly

Specification

1. Electrical Properties :

- 1.1 Frequency Range..... DC~6GHz
- 1.2 Impedance 50Ω Nominal
- 1.3 Insertion Loss.....

2GHz-----	1.2dB
3GHz-----	1.3dB
4GHz-----	1.4dB
5GHz-----	1.5dB
6GHz-----	1.6dB
- 1.4 VSWR..... 1.5 (max)

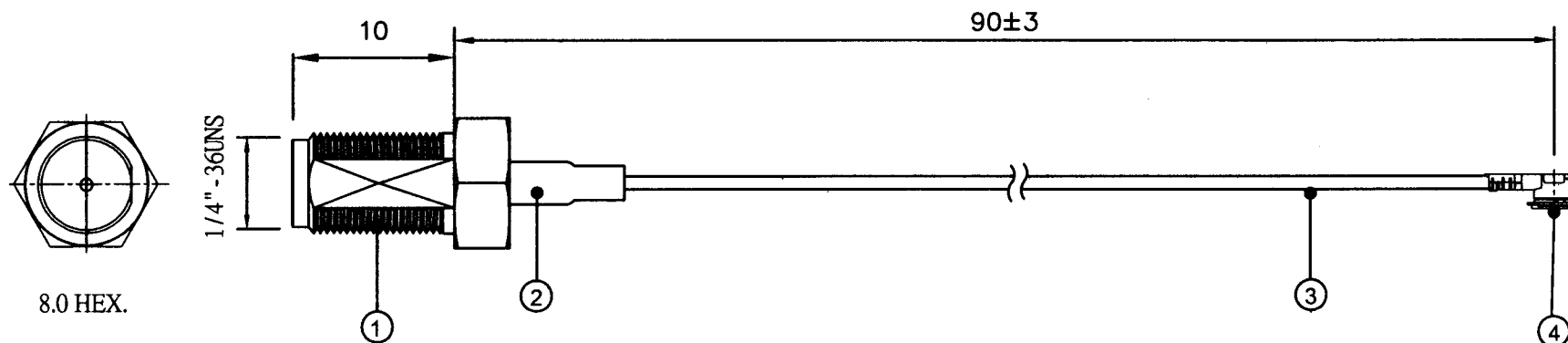
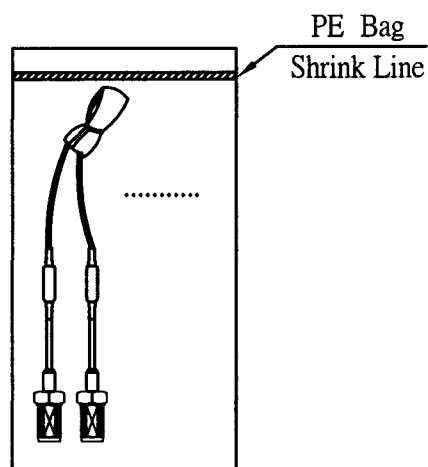
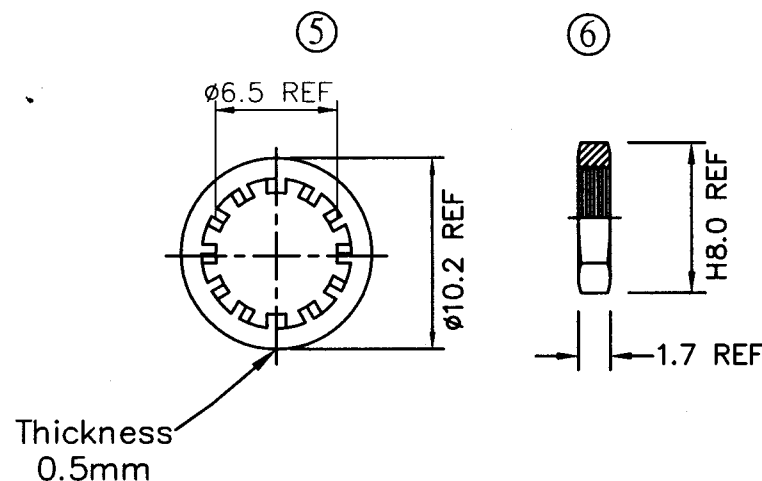
2. Physical Properties :

- 2.1 Cable..... ϕ 1.13 Coaxial Cable
- 2.2 Operating Temp. -20°C ~ +65°C
- 2.3 Storage Temp. -30°C ~ +75°C
- 2.4 Connector..... SMA Jack Reverse Connector
- 2.5 Connector..... I-PEX MHF Connector

CG-

14G156002600

REV	DATE	DESCRIPTION
X1	07/06-2004	New Issue
X2	06/27-2006	Add Part No



6	Nut	Brass ; Gold Plated	1	
5	Washer	Brass ; Gold Plated	1	
4	Connector	MHF Connector	1	
3	Cable	Ø1.13 Cable	1	
2	Tube	Heat Shrink Tube	1	
1	Connector	SMA Straight Jack/Reverse	1	
NO	DESCRIPTION		QTY	REMARK

Packing : 25 pcs/bag

CUSTOMER'S SINGATURE

XX	±3.0	APPROVED
X	±2.0	CHECKED
.X	±1.0	DRAWING
.XX	±0.5	
.XXX	±0.1	

CUSTOMER: 華碩科技股份有限公司

PART NO : 14G152056000

PARTNAME: RF Cable Assembly

W.Y P/NO : C660-510019-A

REV	UNIT	FILE
X2	mm	SHEET : 1/1

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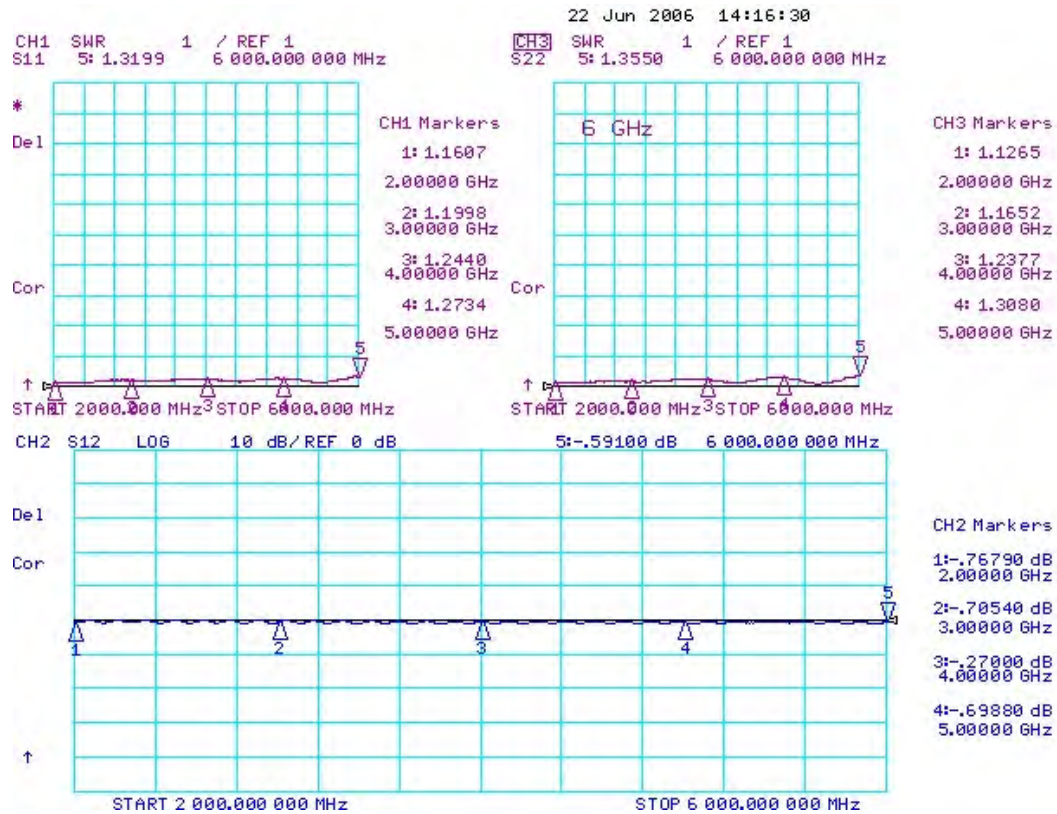
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RF Cable Assembly

P/NO : C660-510019-A SPEC : DC ~ 6GHz

S11 : SMA Jack Reverse

S22 : MHF Connector



6/22/2006



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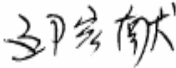
PART NAME: DPR-2320 Antenna Assembly

PART NO.: 14G151037000

REVISION:

W. Y. P/NO.: C660-520100-A

REV.: XI

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DATE :	5/5/06	

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INDEX

<i>Item</i>	<i>Content</i>
1.	天線規格表
2.	成品圖
3.	測試報告
4.	天線本體(PCB板)材質
5.	背膠(3M 467)材質
6.	Cable規格
7.	Connector材質

Antenna Assembly

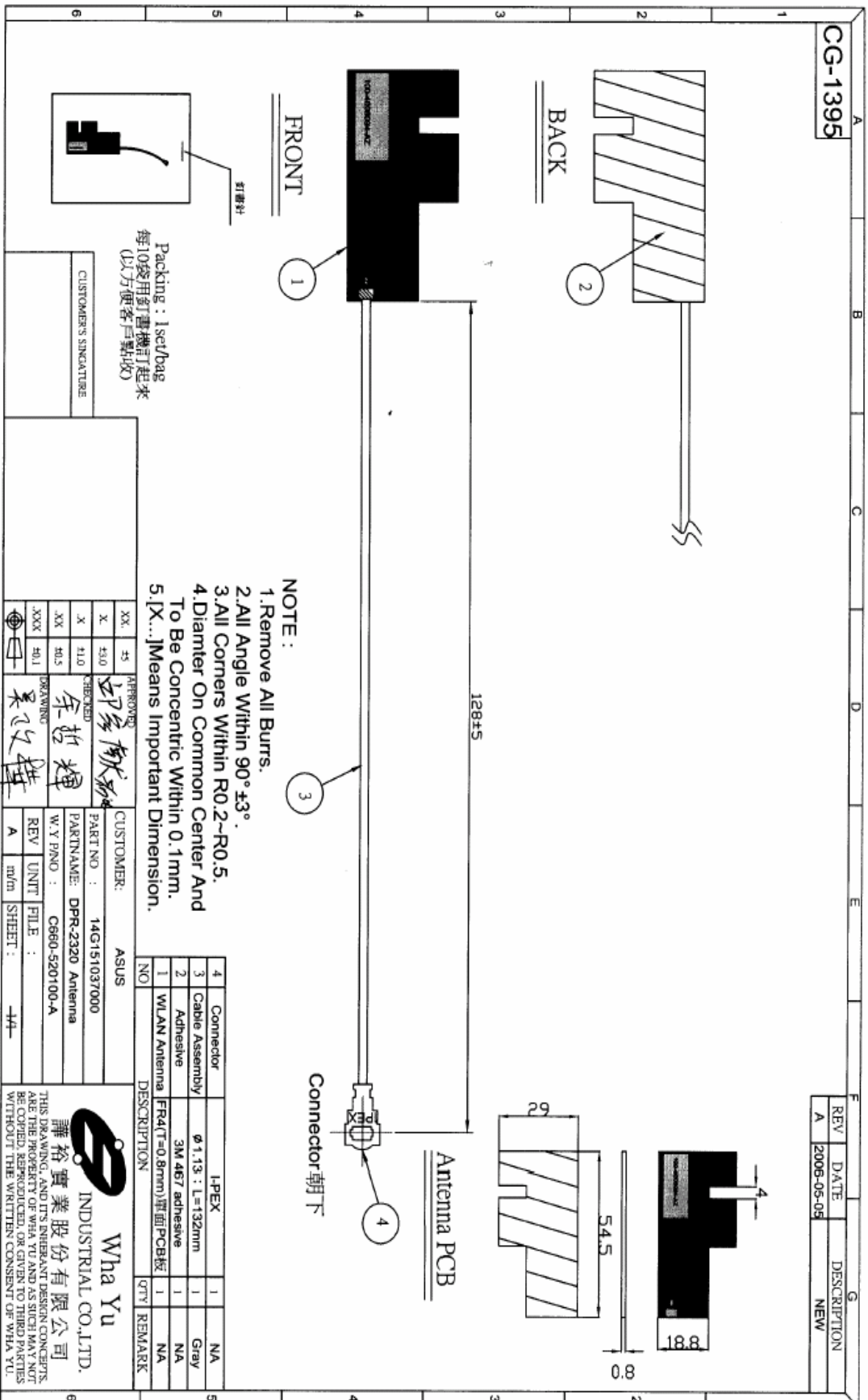
Specification

1. Electrical Properties :

- 1.1 Frequency Range..... 2.4~2.5GHz
- 1.2 Impedance..... 50Ω
- 1.3 Return Loss..... $<-10\text{dBi}$
- 1.4 VSWR..... 1.92 Max.
- 1.5 Peak Gain..... $<2.0\text{dBi}@2.40\sim 2.50\text{GHz}$
- 1.6 Average Gain..... $>-3.0\text{dBi}@2.40\sim 2.50\text{GHz}$
- 1.7 Admitted Power..... 1W

2. Physical Properties :

- 2.1 Operating Temp..... $-10^{\circ}\text{C} \sim +55^{\circ}\text{C}$
- 2.2 Storage Temp..... $-30^{\circ}\text{C} \sim +75^{\circ}\text{C}$





WHA YU INDUSTRIAL CO., LTD

ASUS VOIP Model Small Case Test Report

Measurement Time : 2006/01/16

Measurement Instrument :

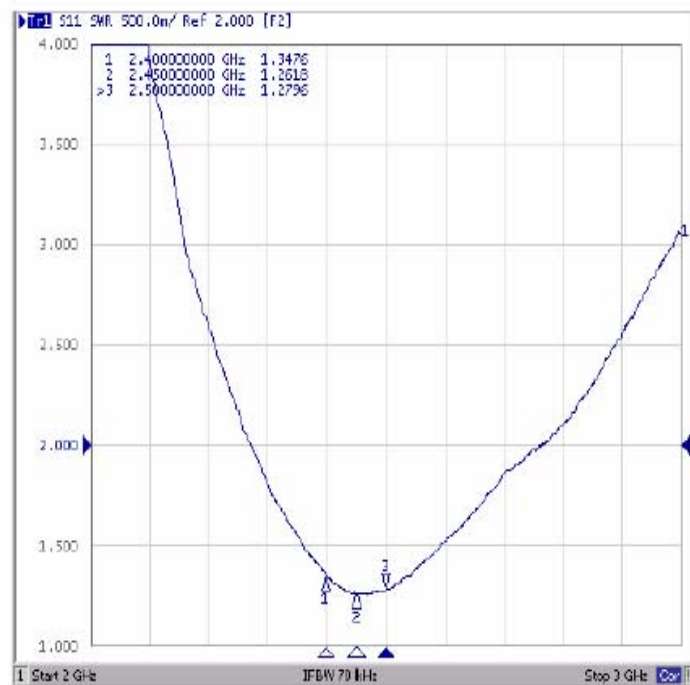
1、Agilent Technologies E5071A 300K~8.5GHz ENASeries Network Analyzer

2、Chamber : 3.5m(W) * 3.25m(H) * 7.12m(L)

Gain Horn Antenna : SG-430 1.7~2.6GHz

Measurement Frequency : 2.4 GHz ~ 2.5GHz

Antenna VSWR



Antenna	VSWR		
Frequency	2.4GHz	2.45GHz	2.5GHz
Small Case Side	1.34	1.26	1.27



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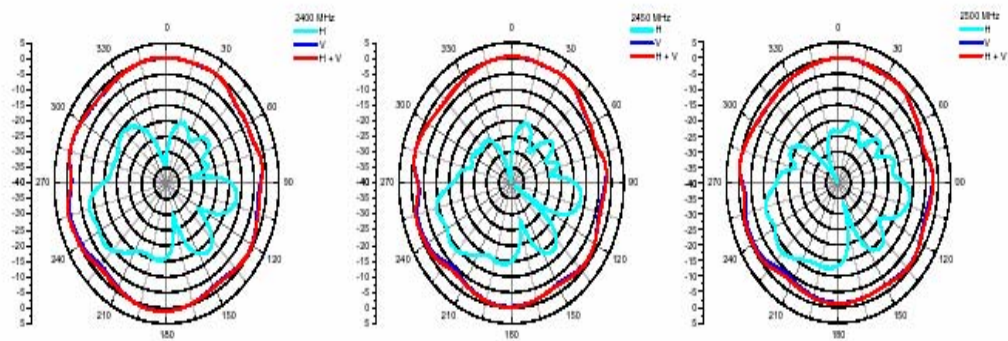
Antenna Peak Gain & Average Gain Test Result

Antenna	Peak Gain (dBi)			Average Gain (dBi)		
Frequency	2.4GHz	2.45GHz	2.5GHz	2.4GHz	2.45GHz	2.5GHz
Small Case Side	1.08	0.54	0.15	-0.66	-1.32	-1.45

Antenna Pattern

Small Case Side

2.4GHz~2.5GHz



NP-150R

Glass cloth base epoxy resin flame retardant copper clad laminate

FEATURES

- High luminance of epoxy contrast with copper for laser type A.O.I.
- UV solder mask may be applied simultaneously to increase yields.
- High performance epoxy blended to achieve higher resistance than that of FR-4-86
- Thickness 0.8mm capability
- Other properties are similar to NP-140

PERFORMANCE LIST

Characteristics	Unit	Conditioning	Typical Values	SPEC
Volume resistivity	MΩcm	C-96/35/90	$5 \times 10^8 \sim 5 \times 10^9$	$10^8 \uparrow$
Surface resistivity	MΩ	C-96/35/90	$5 \times 10^8 \sim 5 \times 10^9$	$10^4 \uparrow$
Permittivity 1MHZ	-	C-24/23/50	4.2-4.8	5.4 ↓
Loss Tangent 1MHZ	-	D-24/23/50	0.010-0.016	0.035 ↓
Arc resistance	SEC	D-48/50+D-0.5/23	120 ↑	60 ↑
Dielectric breakdown	KV	D-48/50	60 ↑	40 ↑
Moisture absorption	%	D-24/23	0.05-0.10	0.35 ↓
Flammability	-	C-24/23/50+E-24/125	94V0	94V0
Peel strength 1oz	lb/in	288°C × 10" solder floating	10-14	8 ↑
Thermal stress	SEC	288°C solder dipping	200 ↑	10 ↑
Pressure cooker (2 atm 12°C)	1/2hr	SEC	288°C dipping	230
	1hr	SEC	288°C dipping	220
	2hr	SEC	288°C dipping	150
Flexural strength	LW	psi	A	70000-80000
	CW	psi	A	60000-65000
Dimensional stability X-Y axis	%	E-0.5/170	0.005-0.030	0.050 ↓
Coefficient of thermal expansion				
Z-axis before Tg	in/in/°C	TMA	5×10^{-5}	N/A
Z-axis after Tg	in/in/°C	TMA	25×10^{-5}	
Glass transition temp	°C	DSC	150 ±5	N/A

Data shown are nominal values for reference only.

NOTE:

The average value in the table refers to samples of .062" 1/1.